Space Weather Forecast

Issued on Monday, 24 July 2023 at 01:11 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Chance Minor/Moderate R1/R2 radio blackouts from Moderate-class X-ray flares throughout. Chance of Minor Geomagentic Storm G1, peaking 26 into 27 July.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been low through the UTC day of Sunday 23 July, with X-ray flares showing a low Common-class background, with a peak just shy of Moderate-class at 23/0454UTC from the largest and most magnetically complex sunspot on the northwest quarter of the Sun. Also observed was a long-period Common-class flare at 23/1457UTC, with this associated with a Coronal Mass Ejection (CME) from another smaller sunspot group in the northwest quadrant, possibly capped by a simultaneous flare from yet another sunspot group on the southeastern solar horizon.

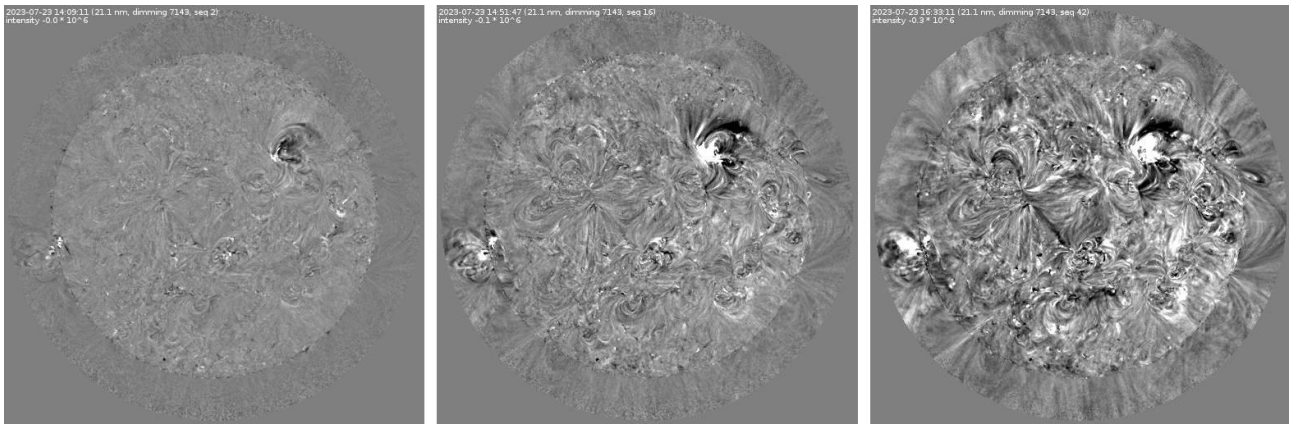

Figure 1: Time-integrated extreme UV satellite imagery showing a dimming signature of the CME from the vicinity of a sunspot here. This CME has been modelled and assessed as having a possible Earth-directed component, with arrival around the turn of the UTC day 26 into 27 July. Image processing courtesy SIDC ROB.

There are currently up to eight sunspot regions on the Earth-facing side of the Sun, with a new small magnetically bipolar region developing in the southwestern quadrant. The most complex region of the current front-side is magnetically simpler than in recent days, is now also showing a reduction in size. A similar reduction in complexity was also seen in two of the other main sunspot groups. All other sunspot groups were inactive and magnetically simple.

Satellite imagery for the UTC day of Sunday shows an apparently wide-angled but slow northwest-heading CME early in the period that is thought to be far-sided (to no effect at Earth). The aforementioned CME from the common class flare in the northwest has been modelled, with a glancing blow possible around the turn of the UTC day 26 into 27 July.

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Solar Wind / Geomagnetic Activity: The solar wind suggests connection to a weak high speed stream, most likely from a 'coronal hole' which is currently indistinct on the southwestern solar horizon. Solar wind speeds were consequently slightly elevated, with a slight downward tendency observed. The number of particles comprising the solar wind was level and within the long-term average, while their associated magnetic field was steady and within background. The north-south component of this field showed a gradual drift from mainly co-aligned to anti-aligned (with Earth's field, the latter usually to greater geomagnetic effect), although this was not impactful.

The net result of the above solar wind measures was for provisionally mainly quiet geomagnetic activity.

Energetic Particles / Solar Radiation: No solar radiation storms were observed.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity carries a daily chance of isolated Moderate-class flares, most likely from the largest and most magnetically complex sunspot group, which should leave the facing side of the Sun midweek. Far side soundings suggest possible returning regions from around the same time, and as a consequence the flare risk is held constant.

Solar Wind / Geomagnetic Activity: A glancing blow from the 23 July CME is possible around the turn of the UTC day of 26 into 27 July. This should bring a chance of Minor Geomagnetic Storm G1 should it affect Earth. Otherwise, a further high speed stream from a coronal hole is forecast to connect with the Earth during 24 July.

Mainly quiet geomagnetic activity is expected, with a slight chance of a G1/Minor Storm from a coronal hole in the current UTC day, and a chance of G1 should the CME affect Earth on 26 into 27 July.

Energetic Particles / Solar Radiation: Solar radiation storms should most likely remain near background levels, although there is a daily slight chance of an S1+ (Minor Solar Radiation Storm or above) event, falling slightly as some of the more potent regions begin to rotate away onto the far side of the Sun from midweek UTC.

Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	10	1	10	30
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

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Radio Blackouts - X Ray Flares:

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	40	40	40	40
Very Active	R3 to R5 X	No	5	5	5	5

Solar Radiation Storms - (High Energy Protons):

Radiation Storms	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ S1	No	10	10	10	5
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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